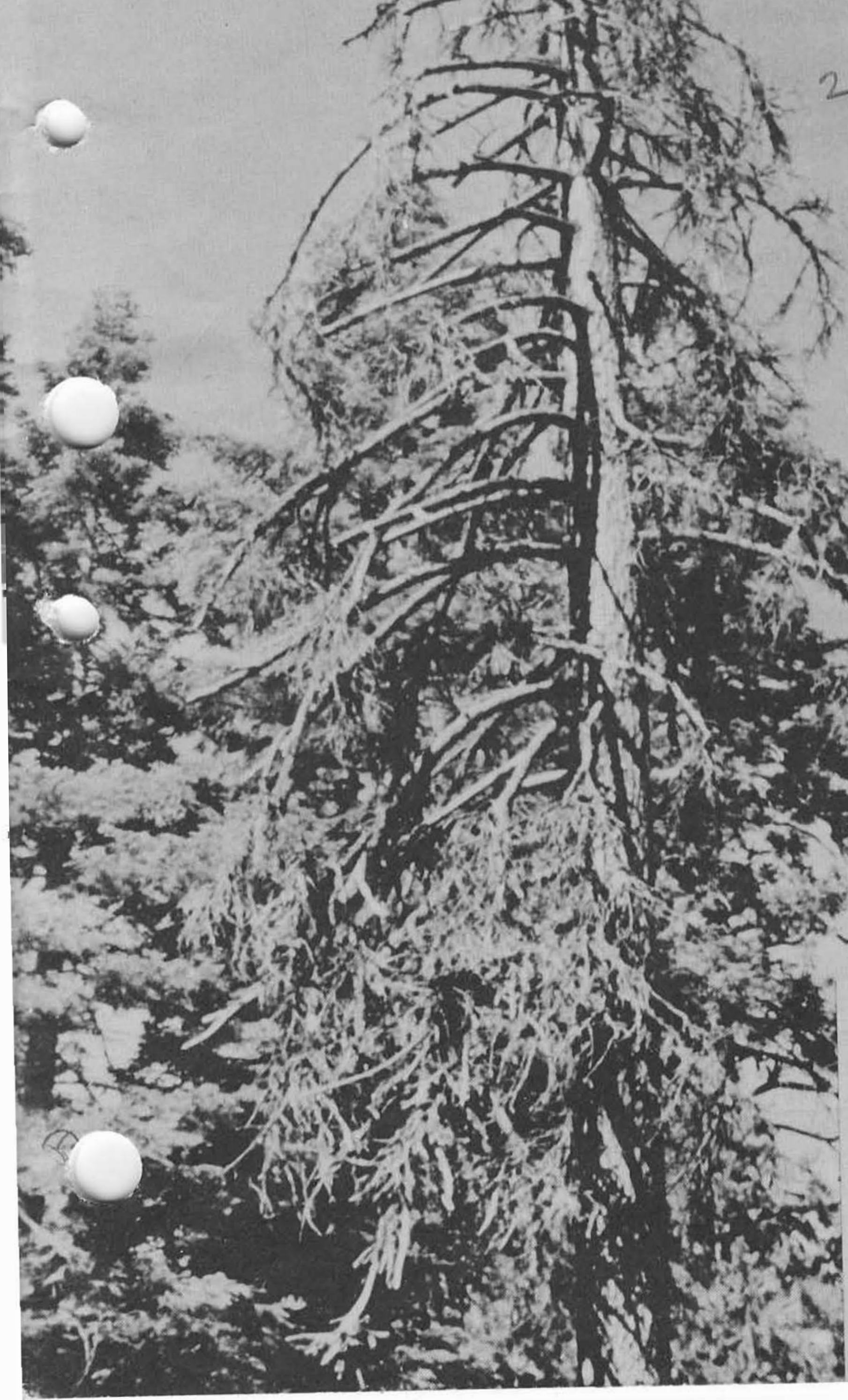
A good handout for inquiries on insects or diseases to public says Averell

FOREST PEST CONDITIONS IN CALIFORNIA 1956



The California Forest Pest Control Action Council is composed of representatives of the following organizations:

California Forest Protective Association

State of California Bureau of Entomology

State of California Division of Beaches and Parks

State of California Division of Forestry

U. S. Bureau of Indian Affairs

U. S. Bureau of Land Management

U. S. Forest Service

U. S. National Park Service

University of California

Western Pine Association

Cover - Old-growth sugar pine tree killed by a heavy infection of dwarfmistletoe.
Inset - Typical dwarfmistletoe plant on a pine branch.

Prepared by the California Forest and Range Experiment Station in cooperation with other members of the Council. Printed and distributed by California Division of Forestry. Additional copies available from either of these sources.

FOREST PEST CONDITIONS IN CALIFORNIA

As Revealed by Surveys During 1956

Official Report of the

CALIFORNIA FOREST PEST CONTROL ACTION COUNCIL

Sacramento January 1957

CONTENTS

SUMMARY OF FOREST PEST CONDITIONS DURING 1956

FOREST INSECTS

Twenty million dollars worth of stumpage is estimated to have been killed by forest insects in California in 1956. This is about $2.00 worth for every person in the State. The total volume killed is placed at about 1,270 million board-feet. Of this amount, approximately 464 million board-feet is pine and the remaining 806 million board-feet, fir. Both stumpage and volume loss are somewhat less than in 1955 due to changes in infestations and in stumpage values. The losses were not as great as anticipated at the outset of the year.

Damage due to the following insects declined sharply: Douglas-fir beetle, Douglas-fir tussock moth, pine engravers, and cone and seed insects. The tussock moth was controlled by sprays; management practices and suppression measures helped nature check pine engravers; natural factors also accounted for the decline of the Douglas-fir beetle and cone and seed insects.

Four forest insect pests continued to do moderate damage, or were destructive in localized areas: western pine beetle, Jeffrey pine beetle, California flatheaded borer, and fir engraver. Normal losses were caused by these insects throughout most of their range. All but the fir engraver, however, were locally quite destructive in southern California. In addition in the westside Sierra foothills in northern California the western pine beetle caused considerable damage in ponderosa pine.

Outbreaks of the lodgepole needle miner and mountain pine beetle continued or increased. In the high Sierras the needle miner continued to ravage extensive stands of lodgepole pine valued for recreational purposes. Mountain pine beetle infestations in needle-miner weakened lodgepole increased considerably. Elsewhere in the State, the mountain pine beetle was epidemic in lodgepole and ponderosa pine stands and showed some signs of increasing in sugar pine in the central and southern Sierras.

Serious insect outbreaks did not develop in the wake of California's extensive forest fires of 1955, although potentials for epidemics were present at the beginning of this year. This favorable situation can be credited to the speed with which most of the fire-damaged timber was salvaged. Some increase in insect activity around these burns may develop in the spring of 1957; therefore all cooperators in the pest detection survey are urged to be especially watchful and to report such activity.

FOREST DISEASES

The 1956 Forest Disease Survey showed that the amount of damage and loss was about comparable to that reported for 1955. Because the 1956 survey was more extensive and thorough than in 1955, the scope of this damage was more fully realized. The generous response of cooperators combined with greater aerial and ground coverage by survey personnel during an entire season of survey has provided a more complete inventory of disease conditions than we obtained in a brief season last year.

Losses from dwarfmistletoe in red fir and sugar pine were found to be more severe and extensive than previously realized. Heavy damage in red fir stands is quite discernible from the air, especially when aerial survey is made in the spring.

Increased damage and mortality from the Elytroderma needle disease was observed in ponderosa and Jeffrey pine stands at several locations in the Sierra, and the disease was found causing damage in Coast Range ponderosa stands.

The limb blister rust on Jeffrey pine was observed over much of this tree's range. The disease apparently predisposes affected trees to beetle attack.

White pine blister rust is epidemic on reproduction, saplings, and small poles of sugar pine in Trinity, Shasta, and Siskiyou Counties. At the higher elevations in these counties it is also present on western white pine and whitebark pine. In the northern part of the State the rust occurs on sugar pines in many localities, and infections extend as far south as Tuolumne County in the Sierra and the Yolla Bolla Mountains in the Coast Range. The amount of infection varies from a single tree here and there to severe infection over areas as large as 100 acres.

Observations revealed that a witches' broom caused by the rust fungus Melampsorella cerastii occurs commonly in red fir stands in the central and southern Sierra.

Mortality of ponderosa and Jeffrey pine reproduction from the Fomes root disease was found to be on the increase on the Sierra Eastside.

FOREST ANIMALS

Damage by bears to young growth in the redwood region increased slightly over 1955 damage. Porcupine damage caused losses throughout the State.

SURVEYS OF FOREST PEST DAMAGE

Entomologists and pathologists are available at the California Forest and Range Experiment Station, Berkeley, California, to aid both public and private land managers in the appraisal of forest pest damage. To enlist this aid, all you need to do is file a "Forest pest report" with the Experiment Station. These detection reports are our first line of defense against insect outbreaks. They are, in addition, the major source of information contained in the annual conditions report and provide a convenient means of informing both supervisors and technical people of forest pest damage.

About one-third more reports were received this year than in 1955. Almost half of the reports received were from State Forestry employees and almost 70 percent of the reports originated from the Central Sierra region. If the contributions of private landowners and publicly employed field personnel had equalled those of the State Forestry personnel in the Central Sierra area, much more adequate coverage of the State would have been attained. This is the second year that animal and disease damage has been included in the pest reports. Reports of disease damage are improving; even though animals continue to cause damage, no detection reports of losses due to animals were received.

It is important to report all forest pest damage at least once each year even though you have reported it before. Even situations that seem to be of little importance or for which no practical means are available for control should be reported, for such situations may continue from year to year and suddenly "blow up," causing extensive damage. It is again the man in the field who must realize this change is occurring and notify technical people. The man in the field cannot be expected to recognize damage until he knows what he is looking for. Instruction

for groups of four or more in the recognition of forest pest damage is available from the Experiment Station upon request. Either a pathologist or entomologist, or both, will aid in such an instructional program.

To aid the detection program, an aerial reconnaissance of the State is made in the spring of the year. Funds available in 1956 provided for about 45 hours of airplane rental. The size of the State allowed only detailed coverage of known infestations and a general coverage of most of the remainder of the State. A fall aerial survey of about 14 hours was again made this year to assess local damage from known infestations.

Where reported situations seem to warrant, a field examination is made by technical personnel and an appraisal report follows the examination. These appraisal reports advise the land owner or manager as to the insect or disease responsible, its possible effects on the remaining stand, and what methods are available to improve the situation. About 50 appraisals were completed during this past season.

Detection of blister rust is a joint undertaking of the California Forest and Range Experiment Station and U. S. Forest Service Administration. The Station is responsible for an annual extensive survey to determine general conditions while Administration is responsible for intensive surveys to determine local conditions on Forest Service, National Parks, State, and private lands. A new method of appraisal is being devised to improve the determination of the intensity and amount of blister rust in the State.

STATUS OF THE MAJOR FOREST INSECT PESTS DURING 1956

WESTERN PINE BEETLE, Dendroctonus brevicomis Lec.
Early in 1956, losses due to the western pine beetle reached outbreak proportions in the second-growth ponderosa pine of the westside central Sierras, particularly in Nevada and Placer Counties. In these two counties an outbreak developed around logging areas in trees damaged by pine engravers in the fall of 1955. To suppress this outbreak, the Osborne Hill Zone of Infestation was established early in 1956 and steps were taken to destroy the overwintering broods. A noticeable reduction in loss was achieved but the infestation was not completely controlled. Losses have continued in parts of the Zone during the summer and early fall. Additional efforts will be needed in the spring of 1957 to control the outbreak within the Zone of Infestation and in adjacent counties.

For several years maintenance control and sanitation-salvage have kept losses due to the western pine beetle fairly low in the forests of southern California. A slight increase in the damage caused by this bark beetle occurred in the San Bernardino Zone of Infestation during 1956. Ponderosa and Coulter pine stands in the San Jacinto area suffered a considerable increase in loss. At Barton Flats, where sanitation-salvage control was applied in 1953-1954, losses were at a very low level.

DOUGLAS-FIR TUSSOCK MOTH, Hemerocampa pseudotsugata McD.
A heavy infestation of the Douglas-fir tussock moth which broke out in Tuolumne County in 1955 was brought under control with aerial sprays in 1956. The outbreak occurred in white fir, and extended over about 10,000 acres, chiefly on the Stanislaus National Forest. Numerous mature and pole-size trees were

Figure 1. Converted B-18 applying DDT spray for control of a forest defoliator.

top-killed, after being defoliated in 1955. In addition, many trees below 10 inches d. b. h. were completely killed. Overwintering eggs hatched in the laboratory in the spring of 1956 indicated that a high population could be expected. Consequently, the infested area was sprayed with DDT in late July. A check made in October showed excellent control; in no case was it found that additional tree mortality resulted from the 1956 feeding. The 1957 population should be very low.

PINE ENGRAVERS, Ips spp.

In 1956 damage from the pine engravers was very light in northern California, but continued to be heavy in southern California. Outbreaks of the California five-spined engraver which erupted around many recently logged areas late in 1955 subsided. Many of the 1955 outbreaks, such as the one in Placer and Nevada Counties, developed from an over-abundance of logging slash and deficient spring precipitation. By contrast, in 1956, the decline of engraver damage in the north was correlated with above-normal spring precipitation, and the increase in the south with precipitation deficiencies.

MOUNTAIN PINE BEETLE, Dendroctonus monticolae Hopk.

Poor detection has permitted a mountain pine beetle outbreak to develop unnoticed during the past 5 years in an isolated lodgepole pine stand in the South Warner Mountains, in the northeast corner of the State. The outbreak is on the Modoc National Forest and extends over some 2, 212 acres in Lassen County. On about 495 acres of this area, almost all the lodgepole is either dead or currently infested. Over the entire area there are about 14, 000 trees containing nearly 290, 000 cubic f

currently infested. In 1955, almost the same amount was killed. If the infestation is allowed to continue, it is expected that most of the lodgepole pine will be killed. Fortunately, the stand is somewhat isolated and therefore the outbreak will probably be contained.

The mountain pine beetle has continued to advance in the mature lodgepole pine stands of the Tuolumne River drainage in Yosemite National Park. In the Dingley Creek basin, a new outbreak developed during the summer in spite of efforts to hold it in check. The trees which became infested have been severely defoliated by the lodgepole needle miner and are particularly susceptible to bark-beetle attack. So long as the needle miner continues to defoliate trees, losses from the mountain pine beetle are likely to continue, and probably to increase. During 1956 a tremendous increase in losses caused by this beetle occurred even in control areas.

This is the seventh year of infestation by the mountain pine beetle in Washoe County, Nevada. Serious losses are occurring in pole-sized ponderosa pine growing in the basin north of Crystal Bay, Lake Tahoe. Instead of being confined to one or two large groups, in a 100-acre area, the infestation now occurs in numerous small groups spread over about 1,000 acres. This year it was found that an aggressive infestation of the western pine beetle has developed in the area, and has already killed a number of trees.

Some increase occurred in the number of sugar pines killed by mountain pine beetle on the west side of the central Sierra, especially in the upper Mokelumne River drainage. These trees occur mostly as scattered individuals or occasionally in small groups. Many infested trees have heavy dwarf-mistletoe infection. The beetle was found to be causing minor damage in overmature sugar pine on the Cannel Meadows District, Sequoia National Forest. It also caused heavy damage to lodgepole pine in many sections of the District, especially in stands adjacent to meadows.

LODGEPOLE NEEDLE MINER, Recurvaria milleri Busck

Defoliation of lodgepole pine by the lodgepole needle miner continues at a high level on 50,000 acres in Yosemite National Park and 3,000 acres in Kings Canyon National Park. The year 1956 was a non-flight year for the needle miner. The insect was in the larval stage all year, feeding voraciously throughout the warmer months. The result was that by late fall most of the more heavily infested stands, such as those surrounding Tuolumne Meadows, had begun to turn brown. Areas previously considered as lightly defoliated were heavily defoliated this year. Needle miner populations were from 3 to 4 times larger than those of the preceding generation in the light and moderately defoliated areas, and in all areas there was an appreciable increase. Field tests showed needle miner larvae can be controlled with insecticides, such as malathion, sprayed with a mist blower. However, comparatively high volumes of spray are needed to kill the insects. Limited spraying was done in the fall near Tuolumne Meadows, Yosemite National Park.

DOUGLAS-FIR BEETLE, Dendroctonus pseudotsugae Hopk.

This year foresters saw the end of the Douglas-fir beetle outbreak in mature Douglas-fir stands in the northwestern part of the State. As predicted in 1955, this outbreak subsided from natural causes about 3 years after it began. Dead trees remain standing and light losses may continue to be noted, but no great amount of damage is expected in 1957.

CALIFORNIA FLATHEADED BORER, Melanophila californica Van D. and JEFFREY PINE BEETLE, Dendroctonus jeffreyi Hopk.

The California flatheaded borer caused the loss of ponderosa and Jeffrey pines on the Los Padres, Angeles, San Bernardino, and Cleveland National Forests of southern California. It also contributed to the death of digger pine in Forest Service campgrounds along the Kern River. The Jeffrey pine beetle alone caused widespread damage to Jeffrey pine in Little Cannel, Long and Cannel Meadows, Kern and Tulare Counties, Sequoia National Forest, wherever Jeffrey pine was a major component of the stand. Five outbreaks also occurred in Ventura and Kern Counties on the Mount Pinos district of the Los Padres: Frazier Mountain and Mill Potrero burns, the YMCA camp area, the portion of Grade Valley as yet uncut by sanitation-salvage and Alamo Mountain. Conditions were not so serious on the Angeles Forest because much of the area has been treated by sanitation-salvage. The number of treated trees dropped from 190 last year to 39 in 1956. Increases in losses on the Arrowhead-Crestline and San Jacinto areas are due in part to these two insects. In the Arrowhead-Crestline area Jeffrey pine, as well as ponderosa, have been weakened by physiological factors and some are being killed by bark beetles.

OTHER IMPORTANT INSECTS

Scattered losses in white fir from the fir engraver, Scolytus ventralis Lec., again occurred throughout the host range, although probably fewer trees were killed this year than last. A serious infestation was observed on Greenhorn Summit, Sequoia National Forest, and evidence of heavy past losses in white fir was noted at Cannel Meadows. A needle sheath miner, Zelleria haimbachi Busck, again was found on outplantings of hard pines at the Institute of Forest Genetics, Placerville, and in the Sugar Hill ponderosa and Jeffrey pine plantings on the Modoc National Forest. The rapid buildup of this moth on planted stock may be a sign of future trouble. The only insect which has thus far shown an increase on burned areas is the red turpentine beetle, Dendroctonus valens Lec. No tree-killing is expected from this buildup. A limited sample showed that the sugar pine cone beetle, Conophthorus lambertianae Hopk., killed an average of 25 percent of the 1956 sugar pine cone crop. Some areas were checked in which no damage occurred, while in other areas the entire crop was destroyed. Douglas-fir cones from the coast area suffered comparatively little insect damage this year. An examination of samples from 8 areas showed that cone moths infested 16.5 percent of the cones. The Douglas-fir seed chalcid, Megastigmus spermotrophus Wachtl. destroyed only 0.4 percent of the seed examined. Cone and seed insects are likel to be more serious in 1957 since it is the year following a heavy cone crop that

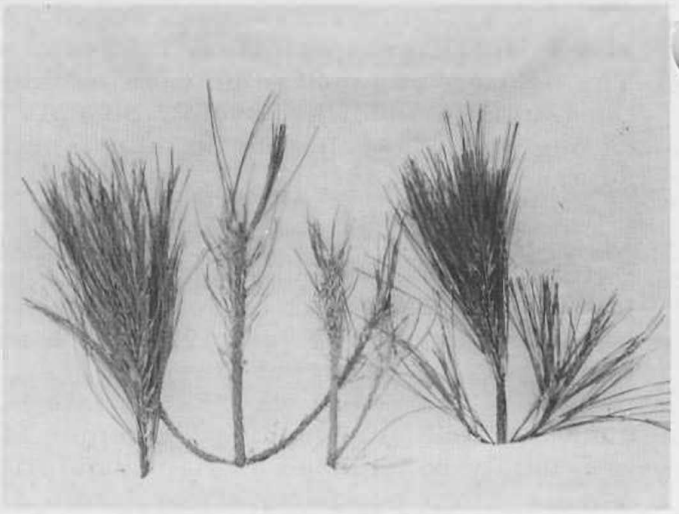


Figure 2. Feeding by the needle sheath miner has caused the defoliation on the center two twigs. Note: Needles not fed on developed normally.

these insects usually become abundant. The black pine leaf scale, Nuculaspis californica (Coleman), was found to be present on only 6.5 percent of trees with symptoms of needle dieback in the Arrowhead-Crestline area in San Bernardino County. The white-fir sawfly, Neodiprion abietis complex, caused light defoliation in white-fir stands from the North Warner Mountains, Modoc County, to the southern Sierras, Madera County. No reports were received of tree mortality. Jeffrey and ponderosa pine in Shasta County are again threatened by the reproduction weevil, Cylindrocopturus eatoni Buch., on a 56-acre plantation on the Shasta-Trinity National Forest. This weevil has already wiped out several pine plantations in northern California.

THE INSECT CONTROL PROGRAM ENDORSED FOR 1957

On November 20, 1956, the California Forest Pest Control Action Council held its annual meeting in Sacramento to review the status of forest pests within the State during the year. The 1956 control projects were discussed and the proposed projects for 1957 were considered. The Council approved the following action:

Lodgepole pine infested by the mountain pine beetle in Dingley Creek, Yosemite National Park, will again be treated in 1957. The control program will be directed at reducing the infestation in Dingley Creek to prevent the advance of this outbreak into the Tuolumne Meadows area. It is not aimed at suppressing the infestation over the entire 6,000 acres where it is now in outbreak. A concerted effort will be necessary to delay the advance of the beetles into new lodgepole stands heavily defoliated by the needle miner.

Direct control of the mountain pine beetle infestation in lodgepole pine in the South Warner Mountains may not be justified. However, if economical, salvage is recommended so as to use as much as possible of the dead timber before insects and rot destroy it. No treatment is proposed of the mountain pine beetle-western pine beetle infestation in ponderosa pine on the north shores of Lake Tahoe, since the landowner is not interested in control.

The lodgepole needle miner outbreak in Yosemite National Park must first be stopped before bark-beetle control can be fully successful. Spraying of accessible high-use recreational areas with a mist blower will continue; additional field tests are to be conducted to find more practical, economic, and effective control methods.

Considerable effort was expended in 1956 on control of western pine beetle within the Osborne Hill Zone of Infestation in Nevada and Placer Counties. Heavy concentrations of infested material were treated and surrounding timber was saved. The infestation, however, did not stop. Losses will probably continue in 1957 and more area may be involved. If further control work is to be done in 1957 this zone will need to be reinstated by the State Board of Forestry.

The poor condition of the Jeffrey pine stand in the Cannel Meadow area has contributed to the large losses in this area from the Jeffrey pine beetle and California flatheaded borer. Sanitation-salvage in this type of stand has reduced beetle-caused losses substantially. A sanitation-salvage sale has been proposed for the area.

Bark-beetle losses in southern California continue to require control. Several groups of trees infested by the California flatheaded borer occurred this year on

ACCOMPLISHMENTS OF RECENT CONTROL ACTION

The following tables summarize the forest insect control and salvage activities of the major private, State and Federal forestry agencies in California for 1956.

TABLE 1.--VOLUME OF INSECT KILLED OR SUSCEPTIBLE TREES REMOVED BY PRIVATE LOGGING COMPANIES DURING 1956

Company	No. Acres	Infested Volume (M.B.M.)	Susceptible Volume (M.B.M.)	Tree species	Control method
Big Bear Timber Company	10,000	700	10,000		
Calaveras Land & Timber Company		250	400	PP, SP	Salvage logging
Collins Pine Company		1,500	1,500		
Diamond Match Company	400	700			
Keen		65		PP	Salvage logging
Kirchner		269		PP, WF, IC	Salvage logging
McCloud River Lumber Company	3,000	3,200	4,000	PP	Salvage logging
Michigan-California Lumber Company		600		PP, SP	Salvage logging
Oviatt-Wetzel Company	400	1,000			
Pacific Gas & Electric		250	6,362		
Paul Bunyan	1,800	810	15,400		
Placerville Lumber Company	30,000				
Potter Lumber Company		212		PP, WF	Salvage logging
Scott Lumber Company	2,440	1,500			
Shasta Forest Products	1,800	1,600			
Soper-Wheeler Company	3,000	778	8,322	PP, SP, WF, DF	Sanitation-salvage
Southern California Edison		1,150	8,300	PP, SP, WF	Selective logging
Southern Pacific Land Company	13,000		30,000		Salvage logging
Stevenson		441		PP, IC	Salvage logging
Stockton Box & Lumber Company	2,320	85			
Tyrrell		282		PP, WF, IC	Salvage logging
U. S. Plywood Corporation	20,000	1,650	1,826		
	88,160	17,042	85,510		

This is not intended to represent the total volume of timber cut in sanitation-salvage, but includes only those companies reporting their annual cut of insect susceptible and infested trees.

TABLE 2.--INSECT CONTROL PROJECTS ACCOMPLISHED ON STATE AND PRIVATE LAND IN 1956 UNDER THE STATE FOREST INSECT CONTROL LAW IN COOPERATION WITH TIMBERLAND OWNERS

Location	No. Acres	No. Trees	Insect	Host	Cost	Control Method
*Arrowhead-Crestline, San Bernardino Co.	15,849	350	Ips, Mc, Db, Dm, Dj	PP, JP, SP, CP	$7,679	Peel-burn, toxic spray
Cuyamaca State Park	10,000	120	Ips, Mc, Db, Dm, Dj	PP, SP	3,579	Peel-burn, toxic spray
Durney Flat, Lassen Co.	4,480	30	Mc, Db, Ips	PP	260	Peel-burn
Osborne Hill, Nevada and Placer Cos.	289,200	1,232	Ips, Db	PP	5,660	Peel-burn
*Stanislaus	2,266	--	Tussock Moth	WF	3,399	Aerial spray
*San Jacinto, Riverside Co.	9,187	411	Mc, Db, Dm, Dj, Ips	JP, PP, SP, CP	6,923	Peel-burn, toxic spray

*Work contracted to the U. S. Forest Service.

TABLE 3.--INSECT CONTROL PERFORMED BY FEDERAL AGENCIES DURING 1956

Location	No. Acres	No. Trees	Insects	Hosts	Control method	Cost
			NATIONAL PARKS			
Lassen-Volcanic	4,000	4	Dj	JP	Fell-burn, toxic spray	$ 1,329
Sequoia-Kings Canyon	31,920	71	Db, Dm, Dj	PP, JP, SP	Fell-burn	5,108
Yosemite	70,000	582	Db, Dm, Dj, Sv	PP, JP, SP, WF LP	Fell-burn	37,711
	105,920	657				$42,819
			NATIONAL FORESTS			
Angeles	4,100	39	Db, Mc, Ips	PP, JP, CP	Toxic spray	$ 1,305
Lassen	7,500	650	Db, Dj	PP, JP	Salvage logging	900
Los Padres	3,220	287	Db, Mc, Ips	CP, PP, JP	Toxic spray	4,210
Inyo	700	32	Dm	LP	Toxic spray	900
*San Bernardino	71,540	1,917	Ips, Mc, Dm, Dj	PP, JP, CP, SP	Peel-burn, toxic spray, salvage	51,028
Sierra	1,000	63	Db, Ips, Dm	PP	Peel-burn	692
*Stanislaus	9,560	1	Tussock moth	WF	Aerial spray	14,295
	97,620	2,988				73,330
			OTHER			
Institute of Forest Genetics	500	807	Db, Dm, Ips	World Sp.	Toxic spray	$ 800

*Includes items reported in table 2.

Key to Abbreviations Used:

Insects

Db - Western pine beetle
Dm - Mountain pine beetle
Dj - Jeffrey pine beetle
Ips - Pine engravers
Mc - California flatheaded borer

Host Trees

PP - Ponderosa pine
SP - Sugar pine
LP - Lodgepole pine
JP - Jeffrey pine
CP - Coulter pine
WF - White fir
DF - Douglas-fir
IC - Incense-cedar

the San Jacinto District of the San Bernardino National Forest, San Bernardino County, even though a maintenance control program has been in progress there for several years. On the other hand, losses remained light on the Arrowhead-Crestline area where the forest is similar but a full-time maintenance control program is carried on. In the areas treated by sanitation-salvage, losses are still much less than in untreated areas. This difference continues to indicate the effectiveness of the method for indirect control of the western pine beetle, the Jeffrey pine beetle, and the California flatheaded borer in mature pine stands. Maintenance control and sanitation-salvage where possible will be continued. Control on the San Jacinto District should be carried on throughout the year. Sanitation-salvage of remote recreational areas would further reduce losses.

Two new areas of infestation involving about 300 acres are the Mill Potrero, Kern County, and the YMCA organizational camp in Ventura County, both on the Los Padres National Forest. Direct control is recommended for both these areas.

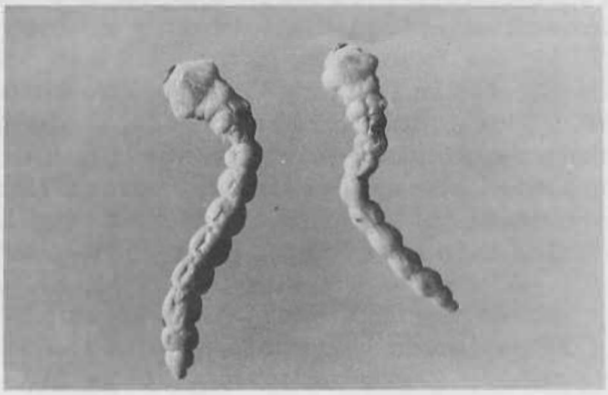


Figure 3. Larvae of California flatheaded borer.

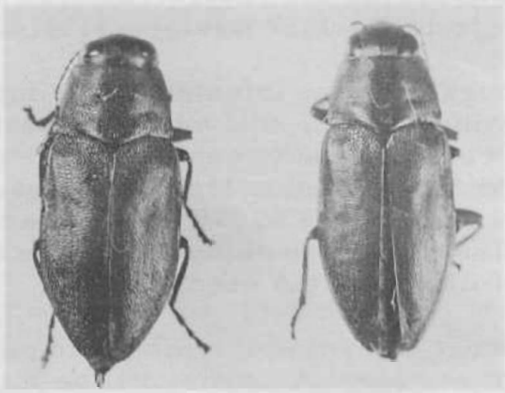


Figure 4. Adult California flatheaded borer.

Figure 6. Ponderosa pine showing external evidence of flathead infestation--short needles and crown deterioration.

Figure 5. Larval mines of the flatheaded borer in ponderosa pine bark.

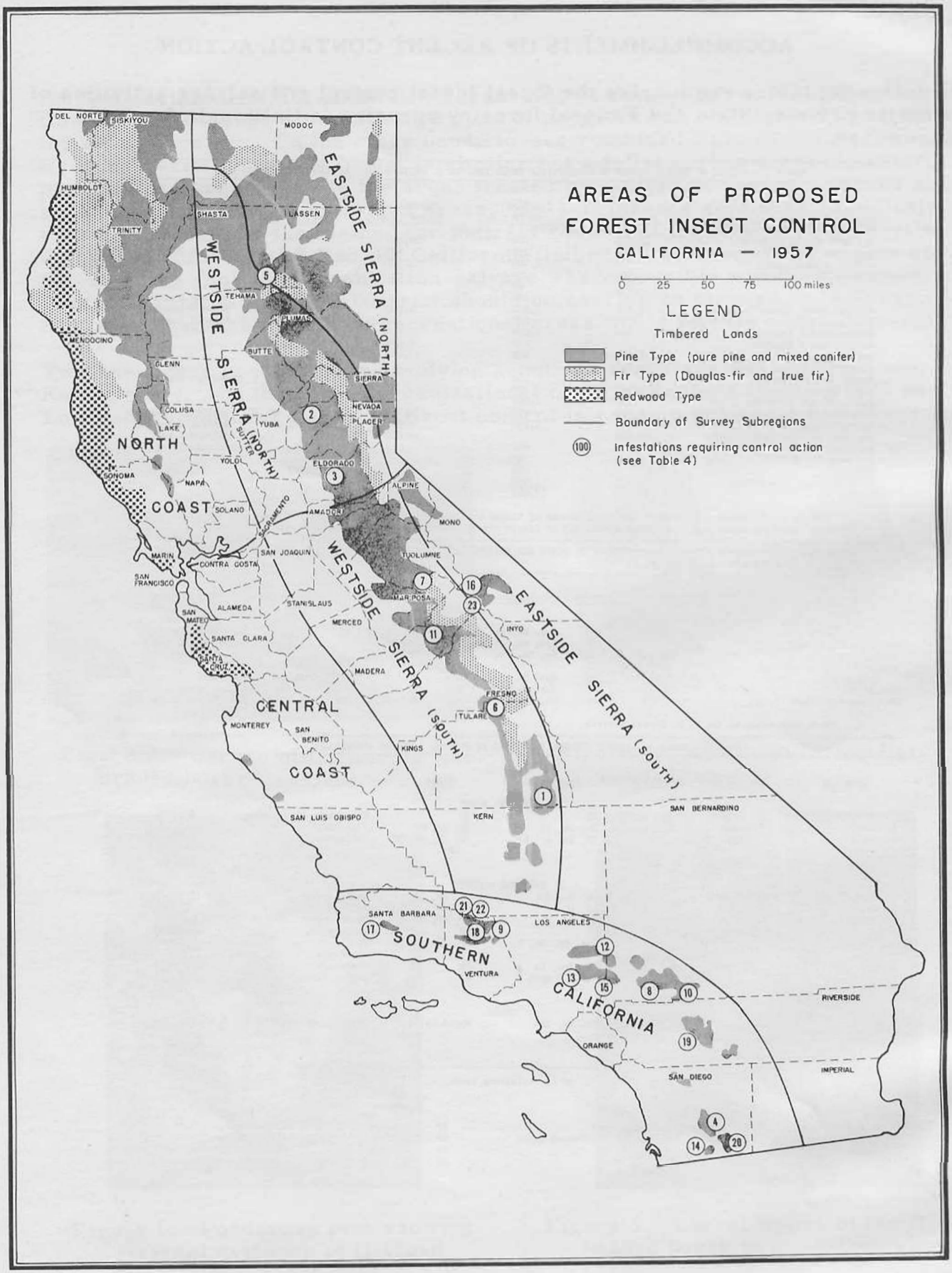

AREAS OF PROPOSED
FOREST INSECT CONTROL
CALIFORNIA — 1957
0 25 50 75 100 miles
LEGEND
Timbered Lands
Pine Type (pure pine and mixed conifer)
Fir Type (Douglas-fir and true fir)
Redwood Type
Boundary of Survey Subregions
(100) Infestations requiring control action (see Table 4)
DEL NORTE
SISKIYOU
MODOC
HUMBOLDT
SHASTA
LASSEN
TRINITY
TEHAMA
PLUMAS
MENDOCINO
BUTTE
GLENN
SIERRA
NEVADA
COLUSA
PLACER
LAKE
YUBA
SUTTER
YOLO
EL DORADO
SONOMA
NAPA
ALPINE
SOLANO
AMADOR
MONO
MARIN
SAN JOAQUIN
CONTRA COSTA
TUOLUMNE
SAN FRANCISCO
MARIPOSA
ALAMEDA
STANISLAUS
INYO
SAN MATEO
MERCED
SANTA CLARA
SANTA CRUZ
MADERA
FRESNO
TULARE
MONTEREY
SAN BENITO
KINGS
KERN
SAN LUIS OBISPO
SAN BERNARDINO
SANTA BARBARA
LOS ANGELES
VENTURA
RIVERSIDE
ORANGE
SAN DIEGO
IMPERIAL
NORTH COAST
WESTSIDE SIERRA (NORTH)
EASTSIDE SIERRA (NORTH)
WESTSIDE SIERRA (SOUTH)
EASTSIDE SIERRA (SOUTH)
CENTRAL COAST
SOUTHERN CALIFORNIA

TABLE 4.--CURRENT FOREST INSECT INFESTATION AREAS REQUIRING ACTION

	PROJECT AREA	LOCATION	INFESTED ACREAGE	INSECT SPECIES CAUSING LOSS	HOST TREES KILLED	RECOMMENDED ACTION
				COMMERCIAL TIMBERLANDS		
(1)	Cannel Meadows	Kern Co.	105,000	Mountain pine beetle Jeffrey pine beetle Fir engraver	Lodgepole pine Jeffrey pine White & red fir	Sanitation-salvage
(2)	Osborne Hill	Nevada & Placer Cos.	289,000	Western pine beetle	Ponderosa pine	Fell-peel-burn, salvage
				EXPERIMENTAL AREAS		
(3)	Institute of Forest Genetics	Eldorado Co.	500	Western pine beetle Pine engravers Needle sheath miner	Ponderosa pine Ponderosa	Maintenance control, fell-peel-burn, or spray with toxic oil Ground chemical spray
				STATE AND NATIONAL PARKS		
(4)	Cuyamaca Rancho State Park	San Diego Co.	8,000	California flatheaded borer	Jeffrey pine	Maintenance control, spray with toxic oil
(5)	Lassen Volcanic National Park	Shasta, Lassen Cos.	8,000	Jeffrey pine beetle Western pine beetle Mountain pine beetle	Jeffrey pine Ponderosa pine Lodgepole pine	Maintenance control, spray with toxic oil Appraise damage; control if warranted
(6)	Sequoia-Kings Canyon National Parks	Fresno and Tulare Cos.	8,500	Western pine beetle Mountain pine beetle	Ponderosa pine Sugar pine	Maintenance control, fell-peel-burn, or spray with toxic oil
(7)	Yosemite National Park	Mariposa, Tuolumne Cos.	10,000	Western pine beetle Mountain pine beetle	Ponderosa pine Sugar pine	Maintenance control, spray with oil or fell-peel-burn
			5,000	Mountain pine beetle Lodgepole needle miner	Lodgepole pine Lodgepole pine	Toxic spray Ground spray
				FOREST RECREATION AREAS		
(8)	Arrowhead-Crestline	San Bernardino Co.	38,000	Mountain pine beetle Western pine beetle Pine engravers Jeffrey pine beetle	Ponderosa pine Coulter pine Jeffrey pine	Maintenance control, fell-peel-burn or toxic spray, salvage
(9)	Alamo Mountain	Ventura Co.	6,500	Jeffrey pine beetle California flatheaded borer Western pine beetle	Jeffrey pine Ponderosa pine	Sanitation-salvage
(10)	Barton Flats	San Bernardino Co.	7,500	Western pine beetle Jeffrey pine beetle	Ponderosa pine Jeffrey pine	Maintenance control
(11)	Bass Lake	Madera Co.	600	Western pine beetle Pine engravers	Ponderosa pine	Maintenance control, fell-peel-burn or toxic spray
(12)	Big Pines	Los Angeles Co.	2,500	California flatheaded borer	Jeffrey pine	Continued sanitation-salvage - maintenance control
(13)	Charlton Flats	Los Angeles Co.	3,000	Western pine beetle Pine engravers California flatheaded borer	Ponderosa pine Coulter pine Jeffrey pine	Maintenance control, fell-peel-burn or toxic spray, salvage
(14)	Corte Madera	San Diego Co.	1,600	Western pine beetle Pine engravers California flatheaded borer	Coulter pine Jeffrey pine Ponderosa pine	Maintenance control, fell-peel-burn or toxic spray
(15)	Crystal Lake	Los Angeles Co.	1,100	Western pine beetle Mountain pine beetle Jeffrey pine beetle	Ponderosa pine Sugar pine Jeffrey pine	Maintenance control, fell-peel-burn or toxic spray
(16)	Deadman Summit	Inyo N. F.	10,000	Jeffrey pine beetle California flatheaded borer	Jeffrey pine	Continued sanitation-salvage - maintenance control
(17)	Figueroa Mountain	Santa Barbara Co.	1,500	Western pine beetle	Ponderosa pine Coulter pine	Maintenance control, fell-peel-burn or toxic spray
(18)	Grade Valley	Ventura Co.	5,000	California flatheaded borer	Jeffrey pine	Continued sanitation-salvage - maintenance control
(19)	Idyllwild-San Jacinto	Riverside Co.	14,500	Calif. flathead borer Western pine beetle Pine engravers Mountain pine beetle	Sugar pine Ponderosa pine Coulter pine Jeffrey pine	Maintenance control, fell-peel-burn or toxic spray, salvage
(20)	Laguna Mountain	San Diego Co.	1,500	Western pine beetle Calif. flathead borer	Coulter pine Jeffrey pine	Maintenance control, fell-peel-burn or toxic spray, salvage; experimental field tests.
(21)	Mount Pinos	Ventura Co.	2,500	California flatheaded borer	Jeffrey pine	Continued sanitation-salvage - maintenance control
(22)	Mill Potrero	Kern Co.	110	Calif. flathead borer Pine engraver	Jeffrey pine	Salvage, toxic spray
(23)	Reds Meadow	Inyo N. F.	700	Mountain pine beetle	Lodgepole pine	Maintenance control, spray with toxic oil

STATUS OF THE MAJOR FOREST DISEASES DURING 1956

DWARFMISTLETOE, Arceuthobium campylopodum Engelm. f. abietinum
In the Sierra damage occurs throughout the red fir range, and heavy losses, especially in old-growth stands, were noted in many places from the north end of Lassen County to the north end of Kern County. In some stands where the less susceptible white fir occurs, red fir is being naturally replaced by white fir. In northern California and the Coast Ranges damage is greatest in the Siskiyou and Trinity Mountains and less severe southward in the Coast mountains, although dwarfmistletoe may be found causing at least minor damage in practically all red fir stands.

DWARFMISTLETOE, A. campylopodum forma blumeri
Thousands of sugar pines throughout the Mokelumne River upper drainage have been killed by this form of dwarfmistletoe, and the rate of kill here is increasing. In parts of this area trees amounting to as much as 50 percent of the sugar pine volume have already been killed. The mountain pine beetle is associated with dwarfmistletoe in this mortality. In more localized areas scattered over Plumas and Lassen Counties dwarfmistletoe is abundant in sugar pines. Numerous trees have been killed and in many more the growth rate has been distressingly retarded.

DWARFMISTLETOE, A. campylopodum forma typicum
Although this disease is statewide, it causes significant losses in ponderosa and Jeffrey pine stands mostly in small localized areas, and the principal damage is caused by malformation and suppression of trees. An exception is a rather

Figure 7. Typical dwarfmistletoe plants on pine branches. The female plants (center), which are light olive-green, produce berries. The male plants (lower right), which are light orange colored, do not produce berries.

extensive area in east Plumas County where about 25 percent of the reproduction on logged areas has been killed in the past 3 or 4 years. Killing of digger pine by this form of dwarfmistletoe occurs at many locations within this tree's range. However, such mortality is of little consequence in most localities. In the high recreational use area of Kern River Canyon, however, it is the only tree of consequence in the many campgrounds. In some of these campgrounds practically every tree has been killed or is so heavily infected that death is certain. In a few of the campgrounds along the river some of the trees can be saved by direct control.

ELYTRODERMA NEEDLE DISEASE, Elytroderma deformans (Weir) Darker
Mortality from this disease in ponderosa and Jeffrey pine stands has been increasing in several parts of the State. At Evans Flat in Kern County mortality has been especially heavy in pole size and young mature trees. Considerable damage was reported in ponderosa stands in the Mokelumne River drainage. Along the southwest side of Lake Tahoe mortality of pole size and larger trees is increasing. Continued tree killing is occurring in Lassen National Park, where many trees have been severely weakened by repeated infections. Heavy infections with severe damage and some mortality of ponderosa pine were reported at several locations west of Elk Creek in Glenn County. This is the first report of damage from this disease in the Coast Range mountains.

Figure 8. Heavy mortality caused by the Elytroderma needle disease in a young-immature stand of ponderosa and Jeffrey pine at Evans Flat on the Sequoia National Forest. Tree crowns are commonly killed gradually from the base toward the top.

COMANDRA BLISTER RUST, Cronartium comandrae Peck.
An appraisal survey made this year on the Goosenest and Ball Mountain area in northern Siskiyou County showed that practically all damage that has occurred or is now occurring in this area is a result of old infections. Very little tree infection has occurred in the past 10 or 15 years, and practically no pine infection is now occurring. Alternate host plants that were abundant in this area 40 years ago are now rare in the area.

LIMB BLISTER RUST, Cronartium filamentosum (Peck) Hedge.
This rust has caused widespread damage to Jeffrey pine stands from Lake Tahoe south to the southern part of Riverside County. East of the Kern River on the Cannel Meadow District of the Sequoia National Forest many infected trees have attracted bark beetle attacks with resulting outbreaks that caused considerable tree mortality. Increasing damage was reported this year from the Mammoth Lake area of Mono County and from the San Jacinto Wild Area in Riverside County.

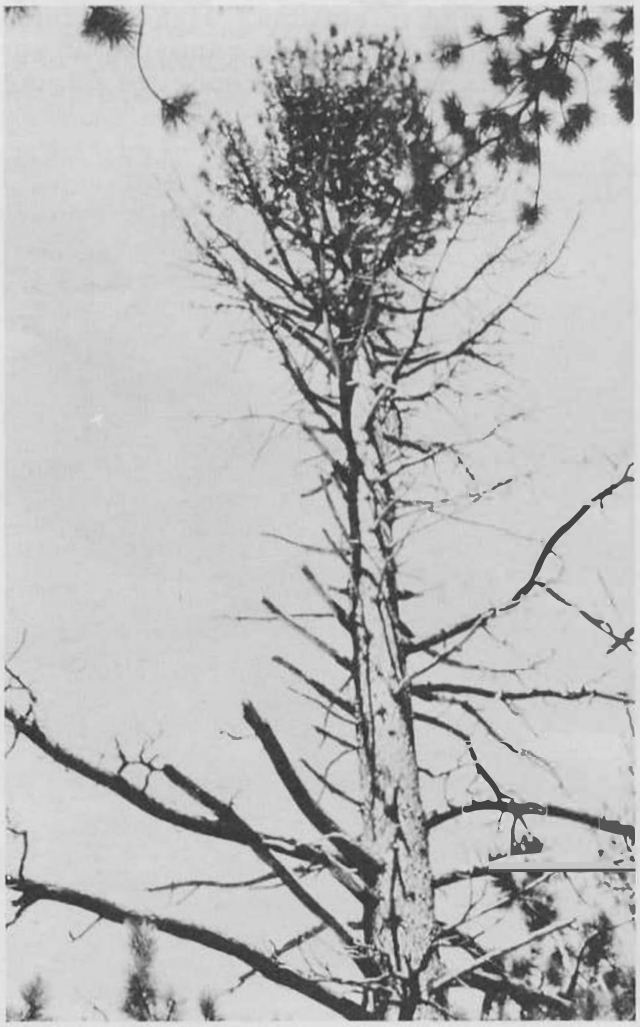


Figure 9. --A mature Jeffrey pine tree with 90 percent of its crown killed by the limb rust. Branch killing usually starts near the center of the crown and progresses both up and down the tree.

Figure 10. Old-growth sugar pine tree badly broomed by dwarfmistletoe, making the tree a high insect risk.

WESTERN GALL RUST, Cronartium harknessii (Moore) Meinecke
Damage from this widely distributed rust was reported this year in a 10-year-old plantation of digger pine at Gold Discovery Site State Park and in ponderosa reproduction involved in stand improvement operations in Siskiyou County.

WHITE PINE BLISTER RUST, Cronartium ribicola Fischer
In northwestern California this rust continues to intensify on pine. On sugar pine the disease is epidemic in many of the stands of Trinity, Shasta, and Siskiyou Counties. Damage is extensive and many small sugar pines have been killed and in some places are beginning to disappear from the stands. In some areas as large as 200 to 300 acres in the lower Klamath River country, as much as 90 percent of the sugar pine trees under 12 inches in diameter are infected. In some smaller tributary drainages such as the East Fork of Indian Creek these small sugar pines are 100 percent infected. The rust is also extending its altitudinal range in the northwestern portion of the State. The disease has continued to creep upwards into the western white and whitebark pine stands wherever ribes species of medium to high susceptibility occur. Serious damage and mortality are occurring in trees of all sizes in the western white and whitebark stands in the Marble Mountains in western Siskiyou County. In the Coast Range no known infection on pine exists south of Yolla Bolla Mountains in southern Trinity County.

In northeastern California and the northern Sierra sugar pines infected with blister rust have been found near Whitehorse in Modoc County and near Chester in Plumas County. Infected whitebark pines have been discovered on Haight Mountain near Tennant in Siskiyou County. These finds extend the known range of infection nearly to the eastern edge of the white pine type in northern California. The rust is present in many localities throughout the sugar pine type in Tehama, Butte, Yuba, and Plumas Counties. The amount varies from a single tree here and there to severe infection over areas as large as 100 acres.

In the central Sierra in Nevada, Sierra, and Placer Counties the rust is general in the North Fork of the Yuba River drainage. Additional infection centers are present in the drainages of Fiddle Creek, Pipe Creek, and Canyon Creek. Most of the streams tributary to the North Fork of the Yuba have diseased sugar pines scattered along them. Sugar pines are infected in the vicinity of French Meadows and Greek Store in Placer County, and other infected trees have been found between the Middle Fork of the American River and the Rubicon River. Scattered blister rust infections occur in El Dorado, Amador, Calaveras, and Tuolumne Counties. The southernmost known infection center was found at Dodge Ridge in Tuolumne County.

YELLOW WITCHES' BROOM, Melampsorella cerastii (Pers.) Schroet.
The large witches' brooms caused by this rust fungus were found from Placer County south through the red fir stands of the Sierra. Very little tree mortality, except occasional small trees, could be attributed entirely to this rust. However, when several brooms occur in a tree, the tree becomes a high risk susceptible to other diseases or insect attack. The heaviest infection observed was on the Cannel Meadow District of the Sequoia National Forest.

FIR NEEDLE CAST, Hypoderma robustum Tub., and Hypodermella abietis-concoloris (Mayr) Dearn.
Heavy damage from these needle-cast fungi in 1955 in Shasta County was repeated in 1956. White fir Christmas tree cutting was impossible in some areas in the

southeastern part of the County. Damage was especially heavy north and west of Lassen National Park.

PINE NEEDLE CAST, Hypodermella medusa Dearn.
The heavy needle kill of 1955 in Lassen County was greatly moderated in 1956. Some trees with severe needle damage last year had no current needle kill.

DOUGLAS-FIR NEEDLE CAST, Rhabdocline pseudotsugae Syd.
This needle cast was heavier on Douglas-fir in 1956 in the Coast Range mountains than noted for many years in the State. Some biological control may have occurred, for a parasitic fungus was found growing on the needle-cast fungus at one location near Parlin Fork State Nursery in Mendocino County. No tree mortality was observed, but should repeated attacks by this needle-cast fungus occur, heavy damage could result.

WHITE FIR LEAFY MISTLETOE, Phoradendron pauciflorum Torr.
The true mistletoe of white fir has killed many tops of mature trees from Calaveras County south. The death of weakened tops is often hastened by attack of fir engraver beetles.

LEPTOGRAPHIUM ROOT DISEASE, Leptographium sp.
Additional mortality of pole-size ponderosa and Jeffrey pine occurred in 1956 on the Blacks Mountain Experimental Forest in Lassen County. However, no current mortality of mature trees from this disease was found this year.

FOMES ROOT DISEASE, Fomes annosus (Fr.) Cke.
Considerable increase in amount of mortality in ponderosa and Jeffrey pine reproduction occurred from this root fungus in 1956 on old logging areas in the Eastside Sierra type.

ARMILLARIA ROOT DISEASE, Armillarea mellea (Vahl.) Quel.
This common root disease, which frequently kills coniferous reproduction and larger young trees, was found killing mature trees of white fir and Douglas-fir in Lassen and Shasta Counties. At one location the disease was reported to be associated with flatheaded fir borer in Douglas-fir trees.

FUSARIUM ROOT DISEASE, Fusarium oxysporum Schl. amend Snyd. and Hans.
Heavy mortality of Douglas-fir seedlings occurred, in the Ben Lomond State Nursery in Santa Cruz County, in the fall of 1955 from root disease fungi. Although several fungi were isolated from the diseased seedlings, this Fusarium was the fungus most commonly isolated.

WINTER INJURY AND OTHER NONINFECTIOUS DISEASES
Sudden cold in the fall of 1955 caused considerable twig kill that became evident in the spring of 1956 on the south and southwest sides of ponderosa, Jeffrey, and sugar pines and Douglas-fir reproduction and larger young trees in northern California. Damage was heaviest in the vicinity of Mt. Shasta, but some extended as far south as Mt. Lassen. Heavy mortality of white fir and Sierra redwood seedlings and practically 100 percent mortality of Douglas-fir seedlings was caused by frost heaving and other winter injury at the Maglia State Nursery in Butte County in the winter of 1955-56 and spring of 1956.

Only a few cases of physiological damage were reported in 1956; the most important

was the stagnation and dying of ponderosa and Jeffrey pines in the Crestline and Arrowhead areas in San Bernardino County. On the Jackson State Forest heavy losses of Douglas-fir seedlings in the Parlin Fork State Nursery occurred in the winter of 1955-56.

UNKNOWN DISEASES

Two unknown diseases, of apparently minor importance, were encountered in 1956. Foliage kill of lodgepole pine associated with an undetermined organism was reported from Tuolumne Meadows in Yosemite National Park. The other, an unknown canker disease killing branches of white fir trees, was found at Evans Flat in Kern County.

STATUS OF FOREST ANIMAL DAMAGE DURING 1956

According to the report[1/] by the California Redwood Association on bear damage to young-growth trees, bear depredation increased slightly over 1955. Although this tree-killing and injury has been substantially reduced by reduction of the bear population, the level is still above that acceptable under good management.

Every year thousands of trees are girdled by porcupines. Private companies and the Forest Service have begun control efforts to reduce the porcupine population in areas of heavy damage. Effort is also being exerted towards the education of hunters in porcupine control. More effort is needed in reporting animal damage so that better organization can be developed for control of injurious animals.

1/ Research Report No. 1. 36123, Interim Report F, Bear Damage to Young Growth Trees, Peter Johnson, California Redwood Association, February 8, 1957.

Table 5. --SUMMARY OF FOREST DISEASE CONTROL OR RECOMMENDED ACTION

Location	Disease	Host Trees	Control or Recommendation
Commercial forests of entire State	Dwarfmistletoe	Red fir Ponderosa pine Jeffrey pine Sugar pine	Recommend eradication of mistletoe infections through silvicultural methods and pruning at time of logging
Kern River Recreational areas	Dwarfmistletoe	Digger pine	Control through sanitation cutting and pruning. Eradicate all female mistletoe plants
Kern County	Elytroderma needle disease	Ponderosa pine Jeffrey pine	Salvage and high risk cutting to be conducted
Mokelumne River	Elytroderma needle disease	Ponderosa pine	Salvage and high risk cutting is being conducted
Lake Tahoe and Lassen Volcanic National Park	Elytroderma needle disease	Ponderosa pine Jeffrey pine	Remove hazardous dead trees and favor other tree species when cutting for recreational development
Glenn County	Elytroderma needle disease	Ponderosa pine	Salvage and risk cutting is being conducted
Mono and Tulare Counties	Limb rust	Jeffrey pine	Risk-mark for cutting all infected trees recommended
Gold Discovery Site State Park and Siskiyou County	Western gall rust	Digger pine Ponderosa pine	Recommend cutting out infections
Sierra Nevada and North Coast Ranges	White pine blister rust	Sugar pine	Control by ribes removal on 468,000 acres
Lassen Volcanic, Yosemite, and Sequoia-Kings Canyon National Parks	White pine blister rust	Sugar pine Western white pine Whitebark pine Foxtail pine	Control by ribes removal on 159,000 acres
Ben Lomond State Nursery	Fusarium root disease	Douglas-fir White fir	Experimental control by chemical application to soil and shaded seed beds.
Magalia State Nursery	Winter injury	White fir Sierra redwood Douglas-fir	Control by mulching recommended
Parlin Fork State Nursery	Physiological injury	Douglas-fir	Experimental control by chemical application
San Bernardino County	Physiological injury	Ponderosa pine Jeffrey pine	Research being conducted